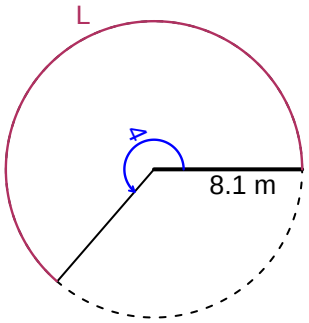
Name: Date:

Trig Final (SLTN v647)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 8.1 meters. The angle measure is 4 radians. How long is the arc in meters?

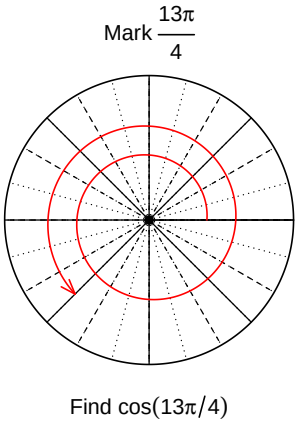


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

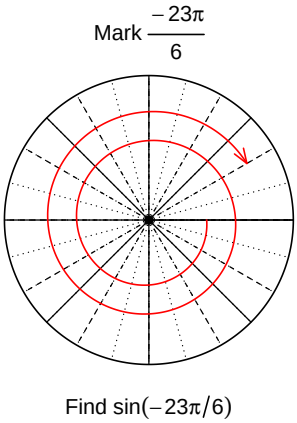
$L = 32.4$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{4}\right)$ and $\sin\left(\frac{-23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(13\pi/4)$



Find $\sin(-23\pi/6)$

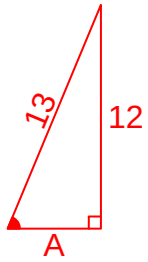
$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-23\pi/6) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{-12}{13}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

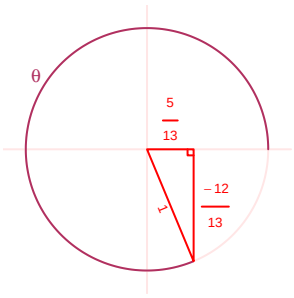
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 12^2 = 13^2$$
$$A = \sqrt{13^2 - 12^2}$$
$$A = 5$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{5}{13}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 6.65$ meters, a frequency of 2.22 Hz, and an amplitude of 5.16 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.16\sin(2\pi 2.22t) + 6.65$$

or

$$y = -5.16\sin(4.44\pi t) + 6.65$$

or

$$y = -5.16\sin(13.95t) + 6.65$$